CLAIMS

1. A steering system of an automotive vehicle comprising:

a steering shaft rotatable about an axis to transfer steering commands to a steering gear of the vehicle; and

at least two energy absorbing units mounted to the steering shaft at respective first and second locations radially equidistant from the axis, each energy absorbing unit comprising a mass supported for reciprocal movement along a path of movement oriented such that the mass travels tangentially with respect to a radius of the steering shaft, and at least one kinetic energy absorption device applying a force to return the mass to a neutral position, the mass and kinetic energy absorption device having dynamic characteristics serving to absorb torsional vibrations experienced by the steering shaft.

2. The apparatus according to claim 1 wherein the path of movement of at least one if the masses is a straight line tangential to the steering shaft.

3. The apparatus according to claim 1 wherein the path of movement of at least one if the masses is an arc following a circumference of the steering shaft.

4. The apparatus according to claim 1 wherein the mass is supported for movement along the path of movement by a case secured to the steering shaft and at least partially enclosing the mass.

5. The apparatus according to claim 1 wherein the kinetic energy absorption device comprises first and second coil springs disposed on opposite sides of the mass.

6. The apparatus according to claim 1 further comprising first and second secondary springs disposed on respective first and second opposite sides of the mass along the path of movement, the secondary springs spaced from the mass when in its neutral position by a distance such that the mass contacts the secondary springs when the mass has moved a predetermined distance from the neutral position.

7. The apparatus according to claim 6 wherein at least one of the secondary springs comprises a foam element secured to an interior surface of the case.

8. The apparatus according to claim 1 wherein the steering shaft comprises a steering wheel and the energy absorbing units are attached to the steering wheel.

9. The apparatus according to claim 1 wherein the energy absorbing units are mounted at diametrically opposite locations relative to the steering shaft.

10. The apparatus according to claim 9 wherein the energy absorbing units are mounted at a three o'clock position and a nine o'clock position when the steering shaft is in a neutral position.

11. A steering wheel for an automotive vehicle, the steering wheel having at least two torsional vibration absorbers secured thereto at respective first and second locations equidistant from a rotational axis of the steering wheel, each energy absorbing unit comprising:

a mass;

a guide fixed to the steering wheel and restraining the mass for reciprocal movement along a path of movement tangential to a radius of the steering wheel; and

at least one kinetic energy absorption device applying a force to the mass along the path of movement to return the mass to a neutral position.

12. The apparatus according to claim 11 wherein the path of movement of at least one if the masses is a straight line tangential to the steering wheel.

13. The apparatus according to claim 11 wherein the path of movement of at least one if the masses is an arc following a circumference of the steering wheel.

14. The apparatus according to claim 11 wherein the guide comprises a case secured to the steering wheel and at least partially enclosing the mass and the kinetic energy absorption device.

15. The apparatus according to claim 11 wherein the kinetic energy absorption device comprises first and second coil springs disposed on opposite sides of the mass.

16. The apparatus according to claim 11 wherein the steering wheel has at least a first spoke and a second spoke and the energy absorbing units are mounted on the first and second spokes.

17. The apparatus according to claim 11 wherein the energy absorbing units are mounted on the steering wheel at diametrically opposed locations.

18. The apparatus according to claim 11 further comprising resilient elements disposed on respective first and second opposite sides of the mass along the path of movement, the secondary springs spaced from the mass by a distance such that the mass contacts the secondary springs

when the mass has moved a predetermined distance from the neutral position.